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How Should Auditors Organize their Employee Structure?

- Employee Structure of Accounting Firms and Audit Quality

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이 유 진

How Should Auditors Organize their Employee Structure?

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Abstract

This study analyzes the effect of audit firm employee structure on audit quality. The study utilizes the disclosure of accounting firm data in Korea mandatory since 2003. Measuring audit quality by performance-adjusted discretionary accruals, this study shows that staffing leverage, experience, and workload per partner are positively related to audit quality, with some indication of a non-linear relationship. The effects are different for Big 4 and non-Big 4 firms, in that the effect of staffing leverage is smaller for the Big 4 firms. This study provides practical guidance on audit quality control for accounting firms, companies, and regulators.

Keywords **:** audit quality, auditor characteristics, employee structure, discretionary accruals, Big 4.

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I. Introduction

After major accounting scandals in 2002, many regulators have sought for measures to ensure a proper level of audit quality and prevent audit failure. For that matter, regulators have turned their focus toward accounting firms and are seeking for various methods that would signal possible strengths or weaknesses of auditors. In Europe, Financial Reporting Council (FRC) and International Organization of Securities Commissions (IOSCO) have required accounting firms to disclose information on their operations and organizational structure that may affect their performance in audits (FRC, 2008; IOSCO, 2009). More recently, in the U.S., PCAOB has taken further action to identify specific quantifiable audit quality indicators (‘AQI’s) and is officially seeking for public comment on the proposal before mandating disclosure (PCAOB, 2015). These movements show that regulators, internationally, have recognized the importance of the internal structure of accounting firms in controlling audit quality. However, there is insufficient research to verify whether and to what extent such auditor characteristics actually affect audit quality and thus whether the additional disclosure would benefit information users.

Using data on Korean accounting firms available since 2003 and financial data on client firms before the adoption of K-IFRS in 2011, I study whether certain firm characteristics of the auditor actually impact audit quality. Audit quality is proxied by the absolute value of discretionary accruals using the modified Jones (1991) model, where performance is adjusted by subtracting the median discretionary accruals of the 20 ROA-ranked portfolios. The auditor characteristics include staffing leverage (staff-to-partner ratio), average experience per personnel, turnover

ratio, and workload per partner. The empirical tests indicate that the more licensed professionals per partner, higher average experience of the audit firm, and higher number of listed audit clients per partner are associated with higher audit quality while turnover is not related to audit quality. The results are robust to change specifications, the post-IFRS period, and alternative performance matching of discretionary accruals. Additionally, accounting firm characteristics differently affect audit quality for Big 4 and non-Big4 firms. Specifically, staffing leverage is not significantly related to audit quality for Big 4 firms, suggesting a possibility that the Big 4 firms are less dependent on the individual auditors as a result of the systematic approach taken in their audit procedures.

This study contributes to the accounting literature by identifying determinants of audit quality at the audit firm-level, specifically, at the audit input level. This provides a link between academia and practices by providing empirical support on the usefulness of information on accounting firm characteristics in predicting audit quality. The results can be used as a guidance for regulators in monitoring the accounting firm-level audit quality and identifying auditors with possible weaknesses. Since the variables analyzed in this study are directly controllable by audit firms, audit firms may adjust their employment structure to control the quality of their audits throughout their offices. Companies will be able to identify high quality auditors in addition to the well-known Big 4 auditors. All in all, I believe this study provides meaningful implications to the academia and practices regarding audit quality.

The rest of the paper is organized as follows: In section II, prior literature on audit quality is reviewed. In section III, possible hypotheses on the relationship

between employee characteristics of accounting firms are developed building on the prior literature. Section IV describes the samples and test design. Section V presents the results of the main tests and Section VI provides sensitivity tests and additional examination of the samples. Section VI concludes and discusses the contributions and limitations of the paper.

II. Prior literature review

2.1 Determinants of audit quality

In the accounting literature, scholars have long tried to identify what determines audit quality. DeAngelo (1981) has suggested that audit quality is determined by the joint probability of discovering a breach in the client's accounting system and reporting the breach by an auditor. Additionally, she argues that auditor size affects both probabilities so that larger auditors provide a higher audit quality. Empirically studies back up for the claims on the auditor size effect. The clients of Big 4 auditors are less aggressive in their earnings management behavior, have higher earnings quality, and show higher earnings responses in the market (Becker, DeFond, Jiambalvo, and Subramanyam, 1998; Francis, Maydew, and Sparks, 1999, Teoh and Wong, 1993). Big 4 auditors are more likely to issue modified audit reports (Francis and Krishnan, 1999), are sued less frequently and are sanctioned less by the SEC (Palmrose, 1988; Feroz et al, 1991). Corresponding to the higher quality, Big 4 auditors charge a premium fee of about 20% (Simunic, 1980) which suggest that large auditors spend more audit effort and that they are valued higher by their clients for the expertise.

There are several other auditor characteristics that have been tested for their effect on audit quality. An auditor who is an industry expert provides higher audit quality and charges a higher fee (e.g. Balsam, Krishnan, and Yang, 2003; Krishnan, 2003; Francis, Reichelt, and Wang, 2005). Independence of an auditor has been of interest for scholars especially after the Arthur Anderson and Enron accounting scandal. To proxy for independence, various measures such as audit firm or partner tenure (Johnson, Khurana, and Reynolds, 2002; Myers, Myers and Omer, 2003; Chen, Lin, and Lin, 2008) and non-audit fees (Frankel, Johnson, and Nelson, 2002; DeFond et al. 2002) have been tested to verify how independence of the auditor affects the audit results.

While there have been many studies that try to identify the determinants of audit quality, it is worth noting that that most of the factors identified in the literature are either not-controllable by the accounting firm, i.e. being a Big 4 auditor, or defined in the context of the relationship between the auditor and client, i.e. industry specialization, tenure, etc. and thus are not determined solely by the audit firm itself. The pre-identified determinants can aid clients when choosing the next auditor, or guide investors when assessing a firm audited by a specific auditor. However, it is not entirely possible for an accounting firm to adjust such factors even if they wished to improve their competence in the audit market. For auditors, it is more important to identify factors that can be managed by the accounting firm so that they can improve their competency.

2.2 Input level audit quality indicators

In the practical field, there have been several attempts to identify audit quality indicators at the audit firm input level, especially after the collapse of Arthur Andersen in 2002. The U.K. Financial Reporting Council has categorized the drivers of audit quality in an accounting firm into 5 aspects: culture, skills and personal qualities of partners and staff, effectiveness of audit process, reliability and usefulness of audit reporting, and other factors (FRC, 2008). In 2009, International Organization of Securities Commissions decided to mandate large accounting firms to prepare transparency reports with information on their internal process (IOSCO, 2009).

Unlike the regulators in Europe, that did not select specific items to be disclosed, the U.S. PCAOB is currently reviewing possible audit quality indicators to specify the disclosure responsibilities of accounting firms. PCAOB acknowledges that, since most information regarding audit quality is determined by the accounting firm and not observable from an outside stakeholder, information provided by the accounting firm itself is essential in accurately assessing and monitoring audit quality (PCAOB, 2015). As of July of 2015, the Board identified 28 potential quality indicators within three main categories: audit professionals, audit process, and audit results. Audit professionals is related to the availability, competence and focus of those performing the audit; audit process includes measures about the auditor's leadership, incentives, independence, infrastructure, and monitoring process; and audit results include the financial statements, internal controls, going concern reports, and communications with the client. The list of items is presented in Table 1. PCAOB is currently seeking public comments on the content and possible uses of the

indicators and ultimately hopes to refine the list to a smaller number that is manageable and effective (PCAOB, 2015).

[Table 1. PCAOB (2015) Concept release on audit quality indicators]

Despite the potential benefits of mandating information disclosure by accounting firms, Francis (2011) points out that the weakness of the regulatory actions lies in the insufficient research that supports the informativeness of such information. The relationship between the suggested indicators and audit quality has not been explained, and thus we cannot be sure whether these indicators actually tell investors anything about audit quality. Regarding the concern, this study attempts to support the regulatory movements by providing empirical evidence on the quality impact of the proposed quantitative indicators.

Among the indicators suggested by PCAOB, this study focuses on the indicators in the 'audit professionals' category. The 'audit professionals' are the resources of an accounting firm that needs to be available for the audit team to proceed on the 'audit process' and obtain favorable 'audit results.' Thus, allocating the resources adequately is important for an auditor to provide audits of high quality and prevent audit failure. This study aims to identify how the resources should be allocated to achieve adequate quality. Also, compared to other categories, 'audit professionals' are the least explored by researchers and thus more research is necessary.

There are prior studies that imply the relationship between such the employee structure characteristics of auditors and audit quality. In the U.S., within smaller accounting firms subject to PCAOB inspection, deficiency firms have less total professionals, larger ratio of partners to professionals, and lower ratio of partners to

issuer clients and lower ratio of professionals to issuer clients (Hermanson, Houston, and Rice, 2007). In the Korean market, global firm affiliations, lower proportion of listed clients, higher ratio of directors to partners, lower ratio of clients to professionals, and lower average experience resulted in less quality control inspections by FSS and KICPA (Choe et al., 2013). Staffing leverage, non-audit workload, joint effect of work experience and excess audit hours are related to audit quality, measured by clients' earnings restatement frequency (Lee, 2012) and earnings response coefficient (Lee and Yoon, 2014). Building on prior studies, I intend to depict a more comprehensive picture by identifying the relative significance and the aggregated effect of the potential quality indicators at the accounting firm input level.

III. Hypothesis development

PCAOB proposes 12 potential AQI's for the 'audit professionals' category. Among them, this study focuses on four indicators: staffing leverage, average work experience of professionals, employee turnover, and the work load of the team, which corresponds to the items number 1, 6, 8, and 2, respectively in Table 1[1], with some modifications from the illustrative calculations provided.

[1] Other indicators proposed by PCAOB regarding audit professionals are excluded for the following reasons:
- Well-established prior studies: industry expertise (item 7)
- Data limitations: chargeable hours of individuals (item 3), audit hours allocated to specific roles or offices of individuals (items 4, 5, 9), training hours (item 10), and audit hours allocated by risk area or procedures (items 11, 12)

Additionally, for the following items, note:
- The concept of staff workload (item 3) may be calculated by combining staffing leverage with partner workload.
- Using employee training expenses per audit professionals as an alternative proxy of training hours (item 10), I find that it does not significantly affect audit quality.

3.1 Staffing leverage

An audit team consists of a partner and staff-level professionals who are certified public accountants (CPAs). The partner is responsible for the audit engagement in general: he or she arranges the audit contract with a client, assesses the overall audit risk, supervises the audit team, determines the audit opinion and signs the final audit report. Staff-level professionals are responsible for the specifics: they perform audit procedures on each financial statement account, communicate with the accounting personnel of the client firm, interpret the audit evidence, assess individual deficiencies and misstatements, and prepare the audit report. Since the two roles are both necessary for the audit process, it is natural to question what combination of the two bring better results. To measure the combination, staffing leverage is defined by the ratio between the numbers of people of each role, i.e. the number of professionals divided by the number of partners.

On one hand, it is expected that a lower staffing leverage, or more partners, would result in higher audit quality. An audit first is initiated by the partner's ex-ante risk assessment and planning, developed through the review process, and finalized by the partner's confirmation of the audit report. Thus the partner is responsible for controlling the overall quality of an audit engagement. If a partner manages a smaller team, it is possible for he or she to allocate more time in supervising the team members and preforming adequate level of review processes. Thus the more time that a partner is able to spend on supervising, a higher audit quality will be achieved. In line with this view, PCAOB indicates that staffing leverage is considered to be a quality indicator because partners need 'sufficient time to oversee the work of the audit staff (PCAOB, 2015).' This implies that PCAOB expects a lower staffing

leverage to be beneficial for achieving a higher audit quality.

On the other hand, it is also possible that higher staffing leverage would lead to higher audit quality. More working level professionals enable the team to perform more detailed and extensive audit procedures. In the U.S. audit market, small audit firms with higher staffing leverage are identified with less deficiencies during PCAOB inspections in the U.S. market (Hermanson et al., 2007). In Korea, higher staffing leverage results in less restatements of financial statements (Lee, 2012) and their earnings are more value relevant with higher earnings response coefficients (Lee and Yoon, 2014). Similarly, studies on professional law firms have identified that a higher associate-to-partner ratio results in a more balanced growth and service quality control (Kordana, 1995; Sherer, 1995).

Due to the countervailing forces, the relationship between staffing leverage and audit quality remains an empirical question. Thus, I present the first hypothesis in null form:

Hypothesis 1a. Staffing leverage within an accounting firm is not related to audit quality.

3.2 Experience

Secondly, the average work experience of the members may affect audit quality in two different directions. Higher experience would be beneficial for the performance of the firm since people need learning time to be familiar to a certain task and this is more so for professional workers. It is shown empirically that when jobs are of an intermediate complexity level, job experience has a substantial direct impact on job knowledge with indirect impact on performance (Schmidt et al. 1986).

Because of the important of on-the-job experience, accounting firm professionals are required to go through a 1-year training period after passing the CPA exam before their CPA license is registered. Additionally, since there are diverse roles within the staff-level audit team, such as the engagement manager and in-charge auditor, it is possible for more experienced professionals to assume part the reviewing role of the partner and supervise the less experienced professionals in a team. In this sense, a higher average experience of a team is expected to improve audit quality with less help needed from the partners.

However, high experience may also hinder with audit quality. Experts are overconfident than relatively inexperienced subjects (Heath and Tversky, 1991) which causes business entry mistakes and business failure as a result of managers acting on the optimism about the relative skill they exhibit (e.g. Roll, 1986; March and Shapira, 1987). Previous studies on Korean accounting firms show that lower average working experience is associated with higher quality controls in FSS inspections (Choe et al., 2013) and have a higher earnings response coefficient (Lee and Yoon, 2014). It is possible that audit firms with less experienced CPAs enhance their internal quality controls to mitigate the risk of low quality and, as a result, achieve higher audit quality (Choe et al. 2013).

Based on the two opposite dynamics, the hypothesis on experience is presented in null form.

Hypothesis 1b. The average working experience of the audit firm is not related to audit quality.

3.3 Employee turnover

Employee retention influences effectiveness since more experienced employees have greater knowledge of organizational and customer goals (Schneider and Bowen, 1985) and turnover requires organizations to devote substantial resources to replacing workers (Wright and Kim, 2004). Empirically, employee turnover is shown to be negatively related to employee productivity and corporate financial performance (e.g. Huselid, 1995). Holm and Zaman (2012) suggest that, to maintaining audit quality, it is essential for audit firms to 'attract and hold well-qualified staff.' This indicates that a low turnover is expected to improve audit quality.

However, it is also possible that increased employee turnover may benefit the organization. For employees who are underperforming significantly, the cost of replacement can be quickly compensated through higher performance by new employees and by motivating the remaining personnel (McElroy, Morrow, and Rude, 2001). There is also evidence that turnover is lower among good performers (McEvoy and Cascio, 1987).

As turnover is expected to affect audit quality in two ways, the relationship remains to be tested empirically. Thus the hypothesis is presented in null form.

Hypothesis 1c. Employee turnover is not related to audit quality.

3.4 Workload of team

The final determinant of audit quality is the workload of the audit team. A high workload may result in reduced performance since heavy workload lead to elevated stress and reduced efficiency (Caplan et al. 1975). In the audit industry, the number

of clients that a team needs to cover is an indicator of workload for the team. In the U.S., small audit firms with larger issuer client-partner ratio are more likely to have deficiencies found during PCAOB inspections (Hermanson et al., 2007). Korean accounting firms with lower listed companies per staff gain more favorable results in FSS inspections (Choe et al., 2013).

However, it is also possible for a higher workload to increase audit quality. A high workload would allow the team to gain experience in a relatively short time, and thus increase the expertise of the team. This mechanism would allow the team to perform better. Additionally, only competent team members can manage to maintain a certain number of clients without failing, suggesting that a higher workload of the audit team will be associated with higher audit quality.

Thus the hypothesis on workload is also presented in null form.

Hypothesis 1d. The workload of the team is not related to audit quality.

3.5 Differential effects of Big 4 firms

Generally, the Big 4 and non-Big 4 firms have different motivations and operations. Large auditors are motivated to perform audits of higher quality because they have a greater brand reputation to protect (Francis and Wilson, 1988). They rely less on a single client (DeAngelo, 1981) and, using their network, they are better able to distribute knowledge within their member firms (Francis et al, 1999; Reynolds and Francis 2000). To achieve higher audit quality, they standardize their staff training, share the specialized knowledge globally, and apply uniform audit methodologies (Francis and Wang, 2008). The investments in such systematic control allows the audit firm to rely less on the individual characteristic of its

employees. Thus, I hypothesize that the effect of employee characteristics on audit quality is lessened in large audit firms.

Hypothesis 2. The impact of employee characteristics on audit quality is stronger in non-Big 4 firms than in Big 4 firms.

IV. Samples and Research design

4.1 Samples

The samples are selected from Korean firms with shares listed in the KSE or KOSDAQ market. For comparability, only firms with fiscal year-ends in December are included. I exclude financial companies since the implications of accruals are different for financial institutes. The client firm financial information is collected from the KISVALUE database and audit firm data is hand-collected from the annual reports of audit firms downloadable from the FSS website.

The sample covers years from 2003 to 2010. The sample starts in 2003, because it is the first year that Korean accounting firms disclosed the employee-related information in their annual reports. As Korean listed firms adopted K-IFRS in 2011, the sample period ends in 2010, to preserve the comparability of firm-level financial information across firm years.

Any firm-years without data necessary for calculating discretionary accruals, control variables, or relevant auditor information are excluded from the data. The final sample consist of 745 auditor-year observations and 8,647 firm-year observations. The number of auditor-year and number of firm-year observations per financial year are described in Table 2.

[Table 2. Sample frequency by year]

4.2 Variable definitions:

Audit firm characteristics

The audit firm characteristics for the four hypotheses are defined in line with prior literature. First, staffing leverage, HRLEV, is defined by the natural logarithm of the ratio of number of CPAs to the number of partners[2].

$$\text{HRLEV} = \ln(Number\ of\ CPAs/Number\ of\ Partners + 1).$$

Additionally, the public accountants in the firm can be divided into two separate groups of professionals, registered and unregistered CPAs. In Korea, accountants who pass the CPA exam are allowed to work in accounting firms as auditors. After one year of on-the-job training, they are registered as certified public accountants. The competence and the need for supervision may be different for the two types of professionals. Thus I disaggregate the variable HRLEV into two components and test their impact on audit quality separately.

$$\text{HRLEV.R} = \ln(Number\ of\ registered\ CPAs/Number\ of\ Partners + 1);$$

$$\text{HRLEV.U} = \ln(Number\ of\ unregistered\ CPAs/Number\ of\ Partners + 1).$$

2 The PCAOB provides an illustrative example on the calculation of staffing leverage at the firm value as the ratio of firm audit partners' chargeable hours to chargeable hours of all other engagement personnel. The measure in this study does not count chargeable hours but uses the number of headcounts, which results in assuming the utilization (ratio of chargeable hours to total available hours) as 100%. There are three main advantages in using the number of personnel instead of chargeable hours. First, it is simpler to calculate and easier to interpret. Secondly, it gives information about the total of available resources of an auditor, and thus is more comparable among different auditors. Lastly, the number of headcounts is more objective and verifiable than chargeable hours. Chargeable hours can be managed by the team to obtain a higher compensation, to get a more favorable fee negotiation, or to signal due care to the investors.

Secondly, average experience is calculated by the average number of working experience as a CPA. In the annual reports, audit firms categorize the number of accountants as of the period end into 6 groups based on their experience as an accountant: (a) less than a year, (b) 1 to 3 years, (c) 3 to 5 years, (d) 5 to 10 years, (e) 10 to 15 years, and (f) more than 15 years. The average experience is calculated by multiplying the number of professionals in each category by the median years in the category, i.e. 0.5, 2, 4, 7.5, and 12.5, and for the top group, (f), 17.5 years. The figures are scaled by the total number of professionals to represent the average experience per each CPA and the natural logarithm of the number is used as the main variable.

$$\text{EXP} = \ln((0.5 * (a) + 2 * (b) + 4 * (c) + 7.5 * (d) + 12.5 * (e) + 17.5 * (f)/(number\ of\ CPAs) + 1).$$

Thirdly, employee turnover is calculated by the number of decrease in professionals divided by the average number of total professionals during the year. The average number of CPAs are calculated by the number of CPAs at the beginning of year plus increase in CPAs during the year with weight of 0.5.

$$\text{TURN} = number\ of\ decrease\ in\ CPAs\ /average\ number\ of\ total\ CPAs\ .$$

Lastly, the workload of the audit team is proxied by the natural logarithm of the number of audit clients scaled by the number of partners.

$$\text{WORK} = \ln(number\ of\ audit\ clients/number\ of\ partners\ + 1).$$

The audit clients can be divided into two types, listed and unlisted audit clients. The firm characteristics, and thus the amount of effort needed may be different for listed and unlisted clients. To test the possible differential effects of the two types of

audit clients, I disaggregate the variable into two components.

$$\text{WORK.L} = \ln(number\ of\ listed\ audit\ clients/number\ of\ partners\ + 1).$$

$$\text{WORK.U} = \ln(number\ of\ unlisted\ audit\ clients/number\ of\ partners\ + 1).$$

While the number of audit clients may serve as a proxy for workload, the measure is a rough measure since it does not take into consideration the differential efforts needed for the complexity of the client. On the premise that audit fee is determined based on the risk assessment, and that a more riskier or complex firm receives a higher fee, the level of audit fee per partner is examined as an alternative proxy for workload.

The summary statistics for the audit firm characteristics, both before and after taking the natural logarithm, is presented in Table 3 Panel A. The median (average) number of professionals per partners is 1.40 (2.39) and is composed of 1.07 (1.86) registered CPAs and 0.22 (0.53) unregistered CPAs. In a median (average) accounting firm, the average CPA has 9.6 years of experience and the turnover ratio is 0.13. Also, a typical partner has 8.7 audit clients consisting of 0.9 listed clients and 7.8 unlisted clients. The mean value of the variables are higher than the median value, suggesting that the sample characteristics are skewed to the right. Thus for HRLEV, EXP, and WORK, I take the natural logarithm of each variables for further tests.

[Table 3. Descriptive statistics]

There is a clear difference of the average value of each variables between the Big 4 and non-Big 4 subsamples. The Big 4 accounting firms, compared to the non-Big 4 firms, have a higher registered and unregistered staffing leverage, shorter average experience, higher turnover ratio, and more number of listed and unlisted

clients per partner. The differences of the audit firm characteristics are all significant at the 1% significance level.

Audit quality

Consistent with prior literature, discretionary accruals are used as a proxy for audit quality. To measure discretionary accruals, total accruals, defined as net income less cash flow from operations, are regressed using the following modified Jones (1991) model within the same year and industry:

$$TACC_t = \beta_0(1/TA_{t-1}) + \beta_1(\Delta REV_t - \Delta REC_t)/TA_{t-1} + \beta_2 PPE_t/TA_{t-1} + \varepsilon_t, \quad (1)$$

where TA_{t-1} is total assets for the beginning of period, ΔREV is change in revenue during the period, ΔREC is change in receivables, and PPE is the end of year balance of plant, property, and equipment. The residuals from equation (1) is the raw value of discretionary accruals.

As emphasized by Kothari et al. (2005), the level of discretionary accruals is dependent on the financial performance of the firm. Extreme levels of performance is generally accompanied with extreme levels of discretionary accruals, and thus it is necessary to control for the level of performance when calculating discretionary accruals to reduce type-1 error. To adjust for performance, I rank each firm-year observation by prior year ROA and divide the sample into 20 portfolios based on their rank within each year. The difference between the individual firm's discretionary accruals from equation (1) and the median value of discretionary accruals for the corresponding portfolio is used as the final performance-adjusted discretionary accruals. As a robustness check, I also replicated the tests using alternative methods of performance matching, including (a) calculating the

difference in discretionary accruals between the firms with the closest ROA; and (b) regressing it with ROE as a control variable in equation (1).

For the tests, the absolute value of performance-matched discretionary accruals is used as the dependent variable. A manager of a company who is not satisfied with the firm's performance may in some cases prefer to have higher earnings or lower earnings based on their incentives. In such cases, the manager may use his or her discretion to adjust the recognition of accruals. Based on their incentives, it may result in an income-increasing or decreasing manner. Since such adjustments through discretionary accruals of any direction cause accounting earnings to deviate from the true performance of the firm, a high quality auditor should minimize its use. Thus I expect a more competent auditor to lower the level of absolute value of discretionary accruals.

4.3 Regression models

The four hypotheses are tested using the following regression model, both individually and aggregately:

$$\begin{aligned} ADA_{it} = {} & \beta_0 + \beta_1 BIG4_t + \beta_2 SIZE_t + \beta_3 CFO_t + \beta_4 LEV_t + \beta_5 ATACC_{t-1} \\ & + \beta_6 Vol\_CFO + \beta_7 Growth\_Sale + \beta_8 LOSS_t + \beta_9 MKT_t \\ & + \beta_i AUDCHAR + YearDummies + IndustryDummies + \varepsilon_t \end{aligned} \quad . \quad (2)$$

ADA is absolute value of discretionary accruals calculated by performance matching by the ROA-ranked portfolio. The 4 main variables are included in the regression, and the significance of the β's for each variable would reject each hypothesis.

Control variables are selected to be consistent with prior research (Reichelt and Wang, 2010, Francis and Michas, 2013). *BIG4* is a dummy variable equal to 1 if the

auditor of the company was one of the Big 4 audit firms, and 0 otherwise; *SIZE* is the natural logarithm of the book value of total assets at year-end; *CFO* is the cash flows from operations as stated in the cash flow statement scaled by the beginning of year book value of total assets; *LEV* is leverage at year end calculated as total liabilities divided by total assets; $ATACC_{t-1}$ is total accruals at the beginning of year to control for the reversal of accruals; *Vol_CFO* is the volatility of operating cash flows for 3 subsequent years, from year t-2 to t. *GROWTH_SALE* is the growth rate of net sales over the previous year; *LOSS* is an indicator for net losses that takes a value of 1 if the company has net losses for the period, and 0 otherwise; *MKT* is a dummy variable equal to 1 if the firm is listed in KOSDAQ, and 0 otherwise.

As in prior literature, it is expected that Big 4 auditors would decrease the level of discretionary accruals. Firms with larger size and higher operating cash flows is expected to show lower abnormal accruals. Firms with higher prior year total accruals, higher cash flow volatility, higher sales growth, current losses, and in the KOSDAQ market is expected to have larger discretionary accruals. I do not predict a sign for leverage due to conflicting results in prior studies.

Tests are also performed using a changed specification. Although year dummies and industry dummies are included in the level test, I believe a change regression would further eliminate any fixed effects or the effect of correlated omitted variables that exist in the discretionary accruals of the samples.

$$\begin{aligned}\Delta ADA_{it} = {} & \beta_0 + \beta_1 BIG4_t + \beta_2 \Delta SIZE_t + \beta_3 \Delta CFO_t + \beta_4 \Delta LEV_t + \beta_5 \Delta ATACC_{t-1} \\ & + \beta_6 \Delta Vol\_CFO + \beta_7 \Delta Growth\_Sale + \beta_8 LOSS_t + \beta_9 MKT_t \\ & + \beta_{10} LOSSi_t + \beta_{11} LOSSo_t + \beta_{12} CH_t + \beta_{13} CHu_t + \beta_{14} CHd_t \\ & + \beta_i \Delta AUDCHAR + YearDummies + IndustryDummies + \varepsilon_t\end{aligned} \quad . \quad (3)$$

All variables are defined as in the level regression. Additionally, *CH* is a dummy that has the value 1 if the auditor has been changed and 0 otherwise; *CHU* is the dummy representing whether the auditor change occurred from a non-Big 4 to a Big 4 auditor, and *CHD* is the dummy for auditor change from a Big 4 to non-Big4 auditor; *LOSSin* is the dummy with a value of 1 if it is the first year that a loss has occurred, and *LOSSout* is the dummy with 1 if the firm is no longer in a net loss position.

The main variables of interests are based on auditor-year observations. Because there are multiple observations of the same auditor within a year, the standard errors of the auditor characteristic variables may be inflated. Thus, the t-statistics of the tests are calculated using the standard errors clustered at the auditor level.

The summary statistics of discretionary accruals, control variables, and audit firm characteristic variables for the samples in the regression is presented in Table 3 Panel B. The average level of the absolute value of discretionary accruals is 0.078 with a median of 0.055. Big 4 accounting firms audit 57% of the sample firms. The mean and median value of the total assets in the sample is KRW 553,897 million and 76,433 million, respectively, suggesting that the sample firm size is skewed to the right. The average firm has cash flow from operations of 0.068, leverage of 42.7%, cash flow volatility of 0.088, and annual sales growth of 17.4%. About 19.7% of the sample are loss firms.

Panel C of Table 3 shows the correlation between the variables. Absolute discretionary accruals are negatively correlated with BIG4 but the correlation is not statistically significant. Preliminary evidence on the accounting firm characteristics suggest that the staffing leverage and work load of the team is negatively correlated

with absolute discretionary accruals. Consistent with the mean statistics, the there is a high correlation between the accounting firm characteristics and the BIG4. Big 4 accounting firms have more professionals per partner, lower experience, higher turnover, and more workload per partner.

V. Main test

5.1 Effect of employee characteristics on audit quality

The results for the regression on the relationship between discretionary accruals and the audit firm character variables are presented in Table 4. In Panel A, column (1) shows the regression of ADA with only the control variables identified in prior literature to use as a benchmark. Consistent with prior literature, the coefficient BIG4 is negative, but not significant. SIZE and CFO is negatively correlated with ADA, and LEV, ATACC, Vol_CFO, GROWTH_SALE, and LOSS is significantly and positively related to ADA.

[Table 4. Level regression]

In column (2) of Table 4, the first variable of interest, HRLEV, is included in the regression. The coefficient of HRLEV is significantly negatively related to ADA, with the coefficient -0.0044, rejecting hypothesis 1a. It indicates that audit firms with a higher staffing leverage performs audits with higher quality. This emphasizes the role of working level employees to actually implement a thorough audit work and that the availability is more important that the partner's supervising role. Economically, if HRLEV increases from the median value by 1 standard deviation,

i.e. 3.175 people, then the ADA decreases by 6.7% from the median value, and if a firm hires 1 more professional per partner then the average ADA decreases by 2.8%. This is contrary to the expectations of PCAOB, where it is expected that a lower staffing leverage would indicate higher audit quality since the partners would have sufficient time to supervise. The test suggest that the availability staff is more important than the availability of partners.

Disaggregating HRLEV into registered and unregistered CPAs makes the results more interesting. In column (3), the coefficient for HRLEV_R is significantly negative (-0.0063) while that of HRLEV_U is positive and insignificant. Due to their opposite effects on audit quality, the t-statistics for HRLEV_R becomes greater than that of HRLEV in column (2). Economically, an increase of 1 standard deviation of registered CPA per partner (1 person per partner) from the median value results in a 9.1% (4.5%) decrease in ADA compared to the median value, while the effect of increase in unregistered CPAs is not statistically significant. This indicates that only the increase in registered CPAs per partner improves audit quality. The increase in unregistered CPAs do not improve audit quality, possibly because they require more supervision by the partners compared to registered CPAs. This indicates that while audit firms should hire enough working level CPAs, doing so by hiring unregistered CPAs would not help improve the quality of audit work in the short run. Thus audit firms should try to hire and retain registered CPAs, and utilizing unregistered CPAs should be accompanied by an adequate increase in supervisors to achieve higher audit quality.

The second auditor characteristic variable, EXP, is examined in column (4). The coefficient for EXP is negative and significant (-0.0078). This rejects hypothesis

1b and indicates that the longer working experience of CPAs is helps obtaining better audit quality. Economically, 1 standard deviation increase, or 2.866 years of increase in average experience from the median value decreases the level of absolute ADA by 3.5% from the median value. More specifically, 1 year increase in average experience leads to 1.3% decrease in ADA from the median value. Interestingly, including EXP in the regression makes the coefficient on BIG4 negative and significant. This suggests that the lower average experience of the Big 4 accounting firms may be the reason why the auditor size effect is not observed in the Korean market. In other words, if the Korean Big 4 accounting firms maintain a high level of average working experience of their CPAs, then they may be able to regain their reputation as their counterparts in the international market. This results are interesting since prior studies with restatements (Lee, 2012) or earning response coefficients (Lee and Yoon, 2014) suggest that less experience improves (perceived) audit quality.

In column (5), the effect of employee turnover ratio is tested. In this case, the coefficient for TURN is positive but not significant, so we cannot reject hypothesis 1c. Based on the regression, the level turnover rate, by itself, does not affect audit quality. This may be due to the counterbalancing forces identified in prior literature. Since the current turnover rate is calculated as the firm-level average does not differentiate turnover of more or less competent employees, a more detailed dataset would allow researchers to further investigate the effect of employee turnover on audit quality.

The test results for the last auditor characteristic variable, WORK, is presented in column (6) and (7). The coefficient for WORK is significantly negative, -0.0050,

rejecting hypothesis 1d. The high level of workload is accompanied with a higher audit quality. Increase in the number of audit clients per partner by 1 client (1 standard deviation) from the median decreases ADA by 1.0% (5.1%) from the median firm's ADA. By disaggregating the variable into the number of listed and unlisted audit clients per partner, column (7) shows that the workload from different types of clients have differential effects on audit quality. While the coefficient for WORK_L and WORK_U are both negative, only the coefficient for WORK_L is significant. The significance translates into a 4.5% (5.6%) increase in the level of ADA compared to the median value if the listed clients per partner increases by 1 client (1 standard deviation). This indicates that the more the audit firm audits for listed companies, the better their audit quality is. This differs from prior literature where no significant relationship between listed companies per partner or professionals were observed.

However, it should be noted that the negative coefficient of WORK and WORK_L may be explained by other factors. First, reverse causality issues may exist. In particular, companies, especially listed companies may choose to work with a more competent auditor, i.e. an auditor that reduces absolute discretionary accruals, leading to an increase in the average workload of the team. This concern is partially mitigated through the change specifications.

Finally, in Panel B, I include the auditor characteristic variables simultaneously in one equation to test their relative significance. First, I do not include WORK due to the possible dependency among the variables HRLEV, EXP, and WORK. Auditors may hire more CPAs with higher experience to cover for the higher audit work burden, or they may have to obtain more clients to compensate their CPAs. Due to

such dependency, including all the variables together would result in multicollinearity and thus distort the results.

Column (1) and (2) in Table 4 Panel B presents aggregate results for HRLEV, EXP, and TURN. Consistent with the individual regressions, HRLEV and EXP remains significantly negative at 1% significance level, while TURN is not significant. Interestingly, the magnitude of the coefficients and t-values become greater compared to the individual results. This is because EXP controls for the various level of experiences within the registered CPAs, or HRLEV_R, and, reversely, HRLEV_U controls for extreme low levels of EXP. Additionally, the adjusted R-squared improves to 17.4%, from 17.3% in the individual regressions, suggesting the explanatory power of input-level employee information on audit quality.

Adding WORK in the regression, column (3) and (4) show that the coefficient for WORK variable loses its significance, but the coefficient for WORK_L remains significantly negative. The magnitude and t-statistics of the coefficients for HRLEV and EXP decrease. This could be caused by the multicollinearity between the two variables and WORK, as mentioned above. Due to the reversed causality and multicollinearity issue on the WORK variable I believe that excluding WORK in the aggregated regression provides a more reliable figure. Thus going forward, I would focus mainly on the regression without WORK to avoid such effects.

Table 5 presents the regression results based on the change specifications for each of the individual auditor characteristics in Panel A, and for the aggregated regression in Panel B. In general, the results are similar to the level specification. A minor difference from the individual regressions is observed where HRLEV is not

significant and TURN is negative and significant at the 10% level. Still, in the full regression, HRLEV becomes significant and TURN becomes insignificant, consistent with the level specification. Overall, the results of the change regression confirms the results of the level regression about the effect of auditor characteristics on audit quality.

[Table 5. Change regression]

5.2 Differential effect of Big 4 and non-Big 4 auditors

To test the possible differential effects of the variables on audit quality, the regressions were repeated for the Big 4 and non-Big 4 subsamples.

[Table 6. Big 4 and non-Big 4 subsample test]

Table 6 Panel A and Panel B presents the regression results for the subsamples of Big 4 and non-Big 4 regressions, respectively. For simplicity, the coefficients of the control variables are not presented.

For the both subsamples, the coefficients of EXP remains significant for both level and change regressions. However, the coefficients for HRLEV, while still negative, are significant only in the non-Big 4 subsample. The coefficient for TURN is negative is significant in the Big 4 subsample, but only in the level regression. Interestingly, the adjusted R-squared for the Big 4 subsample does not change even if the characteristic variables are all included. On the other hand, the non-Big 4 subsample improves by 0.2%, from 18.1% in the base model to 18.3% in the full model. This provides another evidence on the importance of the employee

characteristics on audit quality for auditors of different sizes.

The result confirms hypothesis 2 that the effect employee structure on audit quality is different between Big 4 and non-Big 4 auditors. This is possibly because the Big 4 firms rely less on the number of staff-level in performing audits and rely more on the system for auditing by standardizing audit programs and investing in the training of employees. This is partially suggested by the difference in employee training costs, where the Big 4 and non-Big 4 firms spend an average of KRW 1.23 million and KRW 0.98 million per professionals, respectively, the difference being statistically different at the 10% significance level.

VI. Additional tests

6.1 Alternative calculations of discretionary accruals

In the main test, performance matching of discretionary accruals were done by subtracting the median discretionary accruals within each annual ROA-ranked portfolio. To test the sensitivity of the test results on the definition of discretionary accruals, I also test the model based on three alternative discretionary accruals measure. First, I use performance-matching suggested by Kothari et al. (2005), where discretionary accruals is calculated by the difference of the Jones-model based discretionary accruals between two companies with the closest prior year ROA within each industry-year. The second measure is calculated as the residual from equation (1) by additionally controlling for prior year ROA in the modified Jones model. Keung and Shih (2014) suggest that the performance matching by Kothari et al. (2005) excessively reduces the power of the test and argue that in some cases the

matching procedure may be unnecessary. Thus for the last measure, I also compare the results for the modified Jones model without adjusting for performance to test whether the implications differ significantly.

[Table 7. Alternative calculations of discretionary accruals]

In Table 7, the first two of regressions are based on performance-matching by Kothari et al. (2005), the next two on the modified Jones model, and the remaining on the modified Jones model. In the modified and original Jones model, the results are consistent with the main test results. However, in column (1) and (2), while the signals for all the variables remain consistent, the significance of the coefficients are altered. HRLEV_U becomes positive and significant, which emphasizes the supervisory demand for unregistered professionals. Also, TURN becomes significantly negative, suggesting that a certain level of turnover is necessary for maintaining a favorable level of audit quality. Overall, the relationship between the audit firm characteristics and audit quality remains robust to alternative performance matching of discretionary accruals, with a suggestion of a stronger relationship for some characteristics.

6.2 Non-linear relationship

In developing the hypotheses, it was identified that employee characteristics could have both positive and negative effects on audit quality. The main test is performed by assuming a linear relationship, and found out that staffing leverage and experience positively affects audit quality. However, for some variables, it is also possible that the relationship is non-linear for each of the characteristics due to the

following reasons.

Increase in staffing leverage would increase audit quality due to the availability of staff-level professionals while it may also decrease audit quality because of the increased supervision needed. If there are enough working-level staff (high HRLEV), some of the staff level professionals, such as the manager or senior auditor, may assume part of the supervisory role of the partner. This would require less direct supervision from the partner and thus increase the positive effect of staffing leverage on audit quality.

For working experience, professionals with greater experience are more likely to be overconfident (Heath and Tversky, 1991) causing inferior performance. Thus it is possible that the positive effect of experience on audit quality is lessened for audit firms with more experienced professionals.

Regarding employee turnover, Abelson and Baysinger (1984) have identified that the relationship between employee turnover and organizational performance has an inverted U-shape. Low to moderate levels of turnover generally benefit organizational performance by bringing in new blood and better-trained employees, but such benefits decline as turnover increases. Above some level of turnover, any additional turnover imposes more costs than benefits and thus is detrimental to performance.

To test for the possible non-linear relationships, I define an indicator variable for each characteristic variable as follows:

D_highCHAR = 1 for accounting firms with the value of CHAR higher than the median firm and 0 otherwise,

where CHAR is either HRLEV, EXP, or TURN. The indicator variables are

interacted with the corresponding continuous variable, so that the auditor characteristic variables are subdivided into those with High and Low values.

High_CHAR = *D_highCHAR * CHAR*; and

Low_CHAR = *(1-D_highCHAR) * CHAR.*

The indicator variables and the disaggregated variables were included in the regression to test their separate effects.

[Table 8. Non-linear relationship test]

Table 8 presents the results of testing the non-linear relationship. In the full regression in column (1) and (2), the negative significance of HRLEV and HRLEV_R exists only for the firms with a high HRLEV. This provides preliminary evidence on the importance of the supervisory role of a partner, i.e. the supervisory role of the partner becomes less important if there is sufficient staff-level personnel. However, the difference between Low_HRLEV and High_HRLEV is not statistically significant.

The results show that EXP is only important for lower levels of experience, and the difference between Low_EXP and High_EXP is statistically significant. It indicates that there is no additional benefits in increasing the level of average experience after reaching a certain level. This confirms the claim that more experienced subjects are more likely to be overconfident, which negatively affects the quality of performance.

However, the coefficients for both Low_TURN and High_TURN are not statistically significant. Additionally dividing the sample into quintiles show that turnover negatively affects audit quality only in the highest turnover quintile (untabulated).

Overall, Table 8 provides preliminary evidence on the non-linear relationship between accounting firm employee characteristics and audit quality. A more detailed analysis would allow us to figure out a more accurate picture on non-linear relationship, which remains to be tested.

6.3 Post-IFRS period

The sample period for the main test ends in 2010 to eliminate possible differences in financial information due to the adoption of K-IFRS in 2011. As an additional test, I replicate the tests for firm-years after the adoption of K-IFRS. Although there are not sufficient years available for the Post-IFRS period, it is necessary to verify whether the impact of auditor characteristics on audit quality persist through different periods and for different accounting standards. Especially, as IFRS requires more professional judgment in its applications, it is possible that the power of human resource, both in quantity and quality, may be more important under K-IFRS. I exclude the year 2011 to avoid noise from transition. Because the annual report for accounting firms are only available until the year 2013, the sample period includes only 2 years, 2012 and 2013.

[Table 9. Post-IFRS period]

Table 9 presents the results of the 2-year period regression. Analyzing the test for the full sample show that HRLEV_R remains significantly negative and TURN is not statistically significant. However, HRLEV_U becomes positive and significant and EXP loses its significance. Since IFRS is a principle-based standard, it may be the case that the supervisory role of the partner becomes more important, resulting

in a positive coefficient for HRLEV_U. Also, since the period lies in the early stages of IFRS adoption, the insignificance of EXP may indicate that experience prior to IFRS adoption is less relevant in achieving adequate audit quality in the post-IFRS period. Thus whether the positive effect of higher experience on audit quality persists through the IFRS periods should be examined for future periods.

Turning to the difference in Big 4 and non-Big 4 subsamples, the difference between the two subsamples become less apparent in the Post-IFRS period. Unlike in the pre-IFRS period, HRLEV remains significantly negative for the Big 4 subsample. This emphasizes the role of professional judgement in IFRS standards, that the availability of auditors is important for the Big 4 auditors also. Again, this may be due to the transitional effect since K-IFRS is in its early stage. Whether the effect remains for future periods remain to be evaluated.

VII. Conclusion

In this study, I tested accounting firm characteristics identified by regulators that contribute to the higher performance of auditor at the input level. Utilizing the disclosure information of Korean accounting firms during 2003 to 2010, I was able to find out that a higher staffing leverage and higher average experience of accounting firms contribute to higher earnings quality of the client firms and that the workload per partner is also positively related to audit quality. However, the turnover ratio of professionals does not affect audit quality. Such effects are found both in level and change specifications. Additionally, the impact of staffing leverage was smaller for the Big 4 auditors than that of the non-Big 4 auditors, suggesting large

auditors rely less on individual professionals in their audits. The results are consistent with alternative definitions of discretionary accruals and the samples in the post-IFRS period. Also, preliminary evidence on the non-linear relationship is proposed.

This study focuses on the accounting firm-level characteristics. Recent studies on accounting firms have narrowed their focus down to the partner and engagement level. Engagement-level studies would provide a more refined analysis of the effect of employee structure on audit quality. By examining the firm-level average characteristics, this study may fail to detect some of the more delicate relationship between the variables. However, I believe the firm-level analysis also has its own merits in the following respects.

First, the employee structure at the partner or engagement-level is not a fixed characteristic. For engagements of the same partner, the team members may change frequently. For larger engagements, staffs from a different partner may temporarily work for another partner. Also, the number of professionals assigned to a specific engagement differs based on the risk profile of the client, where it is not easy to quantify such differences. On the other hand, firm-level employee structure is relatively invariant, changing if new personnel are hired or existing professionals leave the firm, and thus contains less noise in measurement. In this sense, comparing the engagement-level characteristics may not be as informative for quality control.

Secondly, for the regulators and information users, firm- or office-level disclosures are more informative regarding audit quality. It is important for an accounting firm or office to have the necessary resources available a priori so that they can assign enough professionals for future engagements and projects. Additionally, the discussions by regulators on the disclosure of engagement-level

information have brought controversies because the risk properties of a specific engagement is confidential information (Bedard, Johnstone, and Smith, 2010). The firm-level audit quality indicators are beneficial in that they provide information without breaching the confidentiality responsibility of an auditor.

I believe this study contributes to the literature in various aspects. First, it adds to the accounting literature on audit quality by identifying additional determinants of audit quality at the audit firm level, the employment structure. This study provides a link between the academia and practices by providing empirical support to the regulators attempts to find audit quality indicators at the accounting firm input level. Also, in addition to requiring disclosure on the indicators, regulators may look into the employment structure and make sure that accounting firms with an unfavorable employee structure, for example, a low staffing leverage or low average employee experience, take due care in their audits.

For accounting firms, this study provides insight on specific means to improve audit quality. The identified variables are especially beneficial since the factors are directly manageable by the auditor through active involvement in designing their employee structure. Accounting firms may establish a policy of maintaining a certain staffing leverage or average experience so that they can protect their reputation throughout offices in diverse geographical areas.

For companies, this study provides proxies for companies choosing an auditor. Until now, companies that sought for a high quality auditor but did not have enough information about accounting firms would choose a Big 4 accounting firm for their reputation. However, by identifying the proxies identified in this study, companies can choose from a non-Big4 auditor with the identified characteristics to get a

comparable audit quality at a lower fee premium.

This study can be extended to international data for a more thorough understanding of accounting firms. For Korean accounting firms, the studies suggest a possibility that the lower average experience of Big 4 firms impedes with the auditor size effect on audit quality. Whether this is generalizable to other countries remains to be tested.

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Appendix. Variable Definitions

Dependent variable

ADA = Absolute value of company's performance adjusted discretionary accruals calculated by allocating each sample into 20 portfolios based on the ROA within each year, and calculating the difference between the individual and portfolio median Jones(1991) model discretionary accruals;

Auditor characteristic variables

HRLEV = The number of non-partner CPAs divided by the number of partners in an accounting firm plus one, and taking the natural logarithm of the ratio;

HRLEV_R = The number of non-partner registered CPAs divided by the number of partners in an accounting firm plus one, and taking the natural logarithm of the ratio;

HRLEV_U = The number of unregistered CPAs divided by the number of partners in an accounting firm plus one, and taking the natural logarithm of the ratio;

EXP = The average experience in years of the average CPA in the accounting firm;

TURN = Number of decrease in CPA during the period / (number of CPAs at beginning of year + increase in CPAs during the period / 2)

WORK = Number of audit clients divided by the number of partners

WORK_L = Number of listed audit clients divided by the number of partners

WORK_U = Number of unlisted audit clients divided by the number of partners

Control variables

BIG4 = dummy variable with the value 1 if the firm is audited by one of the Big 4 accounting firms and 0 otherwise;

SIZE = natural logarithm of the year-end total assets plus 1;

CFO = cash flow from operations scaled by beginning of year total assets;

LEV = total liabilities at end of year divided by total assets at end of year;

ATACC = absolute value of total accruals scaled by beginning of year total assets;

Vol_CFO = the standard deviation of CFO for the 3 years from t to t-2;

GROWTH_SALE = current sales divided by previous year sales minus 1;

LOSS = dummy variable with the value 1 if the firm has negative net income and 0 otherwise;

MARKET = dummy variable with the value 1 if the firm is listed in the KOSDAQ market and 0 otherwise.

[Table 1. PCAOB (2015) Concept release on audit quality indicators]

Category	Subject	Audit quality indicators
Audit profess-ionals	Availability	1. Staffing leverage 2. Partner workload 3. Manager and staff workload 4. Technical accounting and auditing resources 5. Persons with specialized skill and knowledge
	Competence	6. Experience of audit personnel 7. Industry expertise of audit personnel 8. Turnover of audit personnel 9. Amount of audit work centralized at service centers 10. Training hours per audit professionals
	Focus	11. Audit hours and risk areas 12. Allocation of audit hours to phases of the audit
Audit process	Tone at the top and leadership	13. Results of independent survey of firm personnel
	Incentives	14. Quality ratings and compensation 15. Audit fees, effort, and client risk
	Independence	16. Compliance with independence requirements
	Infrastructure	17. Investment in infrastructure supporting quality auditing
	Monitoring and remediation	18. Audit firms' internal quality review results 19. PCAOB inspection results 20. Technical competency testing
Audit results	Financial statements	21. Frequency and impact of financial statement restatements for errors 22. Fraud and other financial reporting misconduct 23. Inferring audit quality from measures of financial reporting quality
	Internal control	24. Timely reporting of internal control weaknesses
	Going concern	25. Timely reporting of going concern issues
	Communications between auditors and audit committee	26. Results of independent surveys of audit committee members
	Enforcement and litigation	27. Trends in PCAOB and SEC enforcement proceedings 28. Trends in private litigation

[Table 2. Sample frequency by year]

	2003	***2004***	***2005***	***2006***	***2007***	***2008***	***2009***	***2010***	***Total***
Accounting firms	68	77	83	91	101	101	109	115	745
Clients firms	773	885	976	1,062	1,135	1,199	1,289	1,328	8,647
Audited by:									
Big4	374	450	578	631	673	691	732	776	4,905
NonBig4	399	435	398	431	462	508	557	552	3,742

[Table 3. Descriptive statistics]

Panel A. Summary statistics: accounting firm-year observations

	All (n=745)					*Big4 (n=32)*			*Nonbig4 (n=713)*		
	Mean	**Median**	**StdDev**	**Min**	**Max**	**Mean**	**Median**	**StdDev**	**Mean**	**Median**	**StdDev**
BIG4	0.060	0.000	0.237	0.000	1.000	1.000	1.000	0.000	0.000	0.000	0.000
HRLEV	2.387	1.400	3.175	0.053	17.225	12.497	12.928	2.572	1.572	1.133	1.678
HRLEV_R	1.855	1.067	2.495	0.000	15.550	9.891	9.830	2.413	1.230	0.854	1.273
HRLEV_U	0.531	0.217	0.856	0.000	5.286	2.606	2.316	1.026	0.342	0.143	0.581
EXP	9.599	9.341	2.866	3.869	15.474	5.216	4.977	0.975	9.606	9.185	2.937
TURN	0.127	0.101	0.121	0.000	0.933	0.206	0.163	0.114	0.129	0.095	0.133
WORK	8.749	7.389	6.361	3.000	111.143	14.883	14.342	2.476	7.034	5.900	6.060
WORK_L	0.920	0.571	1.329	0.000	24.571	2.784	2.743	0.732	0.588	0.333	1.121
WORK_U	7.824	6.833	5.222	2.684	86.571	12.099	11.467	2.232	6.447	5.500	5.132
logHRLEV	0.952	0.875	0.668	0.051	2.903	2.584	2.634	0.196	0.793	0.758	0.525
logHRLEV_R	0.821	0.726	0.613	0.000	2.806	2.364	2.382	0.226	0.679	0.617	0.473
logHRLEV_U	0.331	0.197	0.392	0.000	1.838	1.246	1.199	0.269	0.239	0.134	0.299
logEXP	2.322	2.336	0.282	1.583	2.802	1.816	1.788	0.152	2.322	2.321	0.285
logWORK	2.162	2.127	0.456	1.386	4.720	2.754	2.730	0.155	1.883	1.932	0.670
logWORK_L	0.557	0.452	0.386	0.000	3.241	1.303	1.320	0.272	0.378	0.288	0.359
logWORK_U	2.070	2.058	0.445	1.304	4.472	2.559	2.523	0.168	1.819	1.872	0.654

Panel B. Summary statistics: client firm-year observations

	All (n=8,647)					*Big4 (n=4,905)*			*Nonbig4 (n=3,742)*		
	Mean	**Median**	**StdDev**	**Min**	**Max**	**Mean**	**Median**	**StdDev**	**Mean**	**Median**	**StdDev**
ADA	0.078	0.055	0.078	0.000	0.447	0.078	0.053	0.077	0.079	0.057	0.078
BIG4	0.567	1.000	0.495	0.000	1.000	1.000	1.000	0.000	0.000	0.000	0.000
TA	553,897	76,433	3,249,981	491	107,179,010	689,397	80,398	4,107,484	376,285	73,585	1,496,389
SIZE (logTA)	25.286	25.060	1.429	21.765	30.348	25.339	25.110	1.470	25.217	25.022	1.371
CFO	0.068	0.060	0.133	-0.909	0.972	0.067	0.060	0.129	0.071	0.060	0.138
LEV	0.417	0.418	0.196	0.044	0.893	0.420	0.425	0.196	0.412	0.410	0.196
ATACC(t-1)	0.091	0.060	0.102	0.001	0.784	0.090	0.059	0.101	0.092	0.061	0.102
Vol_CFO	0.088	0.063	0.082	0.003	0.556	0.087	0.062	0.081	0.089	0.065	0.084
GROWTH_SALE	0.174	0.096	0.426	-0.720	3.212	0.170	0.093	0.426	0.179	0.101	0.427
LOSS	0.197	0.000	0.398	0.000	1.000	0.201	0.000	0.401	0.192	0.000	0.394
MARKET	0.556	1.000	0.497	0.000	1.000	0.478	0.000	0.500	0.658	1.000	0.474
HRLEV	8.20	9.37	5.44	0.05	17.23	12.49	12.83	2.44	2.57	2.26	2.17
HRLEV_R	6.49	7.54	4.44	0.00	15.55	9.95	9.84	2.29	1.96	1.75	1.57
HRLEV_U	1.71	1.61	1.40	0.00	5.29	2.54	2.29	1.02	0.61	0.37	1.01
EXP	7.52	6.58	3.17	3.87	15.47	5.18	4.87	0.91	10.60	11.16	2.35
TURN	0.17	0.13	0.15	0.00	0.93	0.21	0.17	0.12	0.12	0.08	0.16
WORK	13.75	12.87	11.05	3.00	111.14	14.16	13.65	2.22	13.22	10.83	16.60
WORK_L	2.32	2.46	2.56	0.00	24.57	2.68	2.69	0.65	1.86	1.19	3.77
WORK_U	11.43	10.71	8.62	2.68	86.57	11.49	10.77	1.99	11.36	9.42	12.91

Panel C. Correlations

	ADA	*BIG4*	*SIZE*	*CFO*	*LEV*	*ATACC*	*Vol_CFO*	*GROWTH_S*	*LOSS*	*KOSDAQ*
ADA	1.00	-0.01	-0.17	-0.05	0.12	0.24	0.34	0.14	0.15	0.10
		(0.2798)	(<.0001)	(<.0001)	(<.0001)	(<.0001)	(<.0001)	(<.0001)	(<.0001)	(<.0001)
BIG4	-0.01	1.00	0.04	-0.02	0.02	-0.01	-0.01	-0.01	0.01	-0.18
	(0.2798)		(<.0001)	(0.1413)	(0.0594)	(0.4401)	(0.1752)	(0.3783)	(0.2896)	(<.0001)
SIZE	-0.17	0.04	1.00	0.00	0.15	-0.17	-0.24	-0.09	-0.11	-0.23
	(<.0001)	(<.0001)		(0.8187)	(<.0001)	(<.0001)	(<.0001)	(<.0001)	(<.0001)	(<.0001)
CFO	-0.05	-0.02	0.00	1.00	-0.15	-0.03	0.08	0.13	-0.34	0.07
	(<.0001)	(0.1413)	(0.8187)		(<.0001)	(0.0017)	(<.0001)	(<.0001)	(<.0001)	(<.0001)
LEV	0.12	0.02	0.15	-0.15	1.00	0.09	0.05	0.07	0.18	-0.01
	(<.0001)	(0.0594)	(<.0001)	(<.0001)		(<.0001)	(<.0001)	(<.0001)	(<.0001)	(0.3542)
ATACC(t-1)	0.24	-0.01	-0.17	-0.03	0.09	1.00	0.44	0.09	0.14	0.10
	(<.0001)	(0.4401)	(<.0001)	(0.0017)	(<.0001)		(<.0001)	(<.0001)	(<.0001)	(<.0001)
Vol_CFO	0.34	-0.01	-0.24	0.08	0.05	0.44	1.00	0.16	0.05	0.13
	(<.0001)	(0.1752)	(<.0001)	(<.0001)	(<.0001)	(<.0001)		(<.0001)	(<.0001)	(<.0001)
GROWTH_SALE	0.14	-0.01	-0.09	0.13	0.07	0.09	0.16	1.00	-0.14	0.06
	(<.0001)	(0.3783)	(<.0001)	(<.0001)	(<.0001)	(<.0001)	(<.0001)		(<.0001)	(<.0001)
LOSS	0.15	0.01	-0.11	-0.34	0.18	0.14	0.05	-0.14	1.00	0.01
	(<.0001)	(0.2896)	(<.0001)	(<.0001)	(<.0001)	(<.0001)	(<.0001)	(<.0001)		(0.1932)
MARKET	0.10	-0.18	-0.23	0.07	-0.01	0.10	0.13	0.06	0.01	1.00
	(<.0001)	(<.0001)	(<.0001)	(<.0001)	(0.3542)	(<.0001)	(<.0001)	(<.0001)	(0.1932)	

* Refer to the Appendix for variable definitions.

	ADA	***BIG4***	***HRLEV***	***HRLEV_R***	***HRLEV_U***	***EXP***	***TURN***	***WORK***	***WORK_L***	***WORK_U***
ADA	1.00	-0.01	-0.02	-0.02	-0.01	0.00	-0.01	-0.04	-0.04	-0.03
		0.28	(0.0432)	(0.0444)	(0.3856)	(0.6595)	(0.4665)	(0.0008)	(<.0001)	(0.0031)
BIG4	-0.01	1.00	0.88	0.88	0.79	-0.86	0.36	0.34	0.51	0.25
	0.28		(<.0001)	(<.0001)	(<.0001)	(<.0001)	(<.0001)	(<.0001)	(<.0001)	(<.0001)
HRLEV	-0.02	0.88	1.00	0.98	0.87	-0.84	0.39	0.60	0.67	0.53
	(0.0432)	(<.0001)		(<.0001)	(<.0001)	(<.0001)	(<.0001)	(<.0001)	(<.0001)	(<.0001)
HRLEV_R	-0.02	0.88	0.98	1.00	0.79	-0.84	0.30	0.51	0.58	0.43
	(0.0444)	(<.0001)	(<.0001)		(<.0001)	(<.0001)	(<.0001)	(<.0001)	(<.0001)	(<.0001)
HRLEV_U	-0.01	0.79	0.87	0.79	1.00	-0.74	0.50	0.62	0.73	0.54
	(0.3856)	(<.0001)	(<.0001)	(<.0001)		(<.0001)	(<.0001)	(<.0001)	(<.0001)	(<.0001)
EXP	0.00	-0.86	-0.84	-0.84	-0.74	1.00	-0.29	-0.27	-0.41	-0.20
	(0.6595)	(<.0001)	(<.0001)	(<.0001)	(<.0001)		(<.0001)	(<.0001)	(<.0001)	(<.0001)
TURN	-0.01	0.36	0.39	0.30	0.50	-0.29	1.00	0.37	0.47	0.33
	(0.4665)	(<.0001)	(<.0001)	(<.0001)	(<.0001)	(<.0001)		(<.0001)	(<.0001)	(<.0001)
WORK	-0.04	0.34	0.60	0.51	0.62	-0.27	0.37	1.00	0.81	0.99
	(0.0008)	(<.0001)	(<.0001)	(<.0001)	(<.0001)	(<.0001)	(<.0001)		(<.0001)	(<.0001)
WORK_L	-0.04	0.51	0.67	0.58	0.73	-0.41	0.47	0.81	1.00	0.72
	(<.0001)	(<.0001)	(<.0001)	(<.0001)	(<.0001)	(<.0001)	(<.0001)	(<.0001)		(<.0001)
WORK_U	-0.03	0.25	0.53	0.43	0.54	-0.20	0.33	0.99	0.72	1.00
	(0.0031)	(<.0001)	(<.0001)	(<.0001)	(<.0001)	(<.0001)	(<.0001)	(<.0001)	(<.0001)	

Refer to the Appendix for variable definitions.

Auditor characteristic variables are calculated in logarithm form (except for TURN)

P-values are presented in parenthesis.

[Table 4. Level regression (n=8,647)]

$$\mathrm{ADA_t} = \beta_0 + \beta_1 BIG4_t + \beta_2 SIZE_t + \beta_3 CFO_t + \beta_8 LEV_t + \beta_5 ATACC_{t-1} + \beta_6\, Vol.CFO + \beta_7\, GROWTH.SALE + \beta_8 LOSS_t + \beta_9 MKT_t + \beta_i AUDITOR.CHAR_t + \gamma YearDummies + \delta IndustryDummies + \varepsilon_t$$

Panel A. Individual regression

Dependent variable = ADA

	(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*	*(7)*
HRLEV		-0.0044**					
		(-2.62)					
HRLEV_R			-0.0063***				
			(-3.42)				
HRLEV_U			0.0028				
			(1.40)				
EXP				-0.0078**			
				(-2.05)			
TURN					-0.0001		
					(-0.02)		
WORK						-0.0050**	
						(-2.18)	
WORK_L							-0.0050*
							(-1.91)
WORK_U							-0.0012
							(-0.44)
BIG4	-0.0013	0.0052*	0.0052*	-0.0062**	-0.0013	0.0001	0.0013
	(-0.91)	(1.81)	(1.69)	(-2.10)	(-0.92)	(0.09)	(0.75)
SIZE	-0.0038***	-0.0038***	-0.0038***	-0.0038***	-0.0038***	-0.0038***	-0.0038***
	(-8.65)	(-8.67)	(-8.70)	(-8.68)	(-8.65)	(-8.65)	(-8.66)
CFO	-0.0192**	-0.0187**	-0.0187**	-0.0194**	-0.0192**	-0.0187**	-0.0186**

	(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*	*(7)*
	(-2.47)	(-2.41)	(-2.42)	(-2.50)	(-2.47)	(-2.41)	(-2.40)
LEV	0.0342***	0.0342***	0.0343***	0.0341***	0.0342***	0.0343***	0.0343***
	(5.74)	(5.76)	(5.75)	(5.71)	(5.74)	(5.76)	(5.76)
ATACC(t-1)	0.0566***	0.0564***	0.0566***	0.0566***	0.0566***	0.0563***	0.0564***
	(4.23)	(4.21)	(4.23)	(4.24)	(4.24)	(4.20)	(4.21)
Vol_CFO	0.2480***	0.2483***	0.2481***	0.2476***	0.2480***	0.2481***	0.2479***
	(18.00)	(17.94)	(17.93)	(18.03)	(18.00)	(18.04)	(18.05)
GROWTH_SALE	0.0171***	0.0171***	0.0171***	0.0171***	0.0171***	0.0170***	0.0170***
	(9.68)	(9.71)	(9.77)	(9.65)	(9.67)	(9.65)	(9.64)
LOSS	0.0194***	0.0195***	0.0195***	0.0193***	0.0194***	0.0194***	0.0194***
	(9.81)	(9.91)	(9.85)	(9.72)	(9.80)	(9.86)	(9.81)
MARKET	0.0029	0.0028	0.0028	0.0027	0.0029	0.0027	0.0027
	(1.60)	(1.59)	(1.58)	(1.55)	(1.60)	(1.54)	(1.54)
Adj. R-squared	0.173	0.173	0.173	0.173	0.173	0.173	0.173
Fixed effects	Year, Industry	Year, Industry	Year, Industry	Year, Industry	Year, Industry	Year, Industry	Year, Industry

Panel B. Aggregate regression

Dependent variable = ADA

	(1)	*(2)*	*(3)*	*(4)*
HRLEV	-0.0066***		-0.0056*	
	(-3.72)		(-1.89)	
HRLEV_R		-0.0080***		-0.0063***
		(-3.95)		(-2.67)
HRLEV_U		0.0021		0.0056*
		(0.84)		(1.83)
EXP	-0.0127***	-0.0120***	-0.0119**	-0.0087*
	(-3.17)	(-2.85)	(-2.61)	(-1.88)
TURN	0.0043	-0.0025	0.0052	0.0021
	(0.95)	(-0.42)	(1.03)	(0.31)
WORK			-0.0014	
			(-0.43)	
WORK_L				-0.0067**
				(-2.57)
WORK_U				0.0003
				(0.12)
Control variables	Included	Included	Included	Included
Adj. R-squared	0.174	0.174	0.174	0.174
Fixed effects	Year, Industry	Year, Industry	Year, Industry	Year, Industry

Refer to the Appendix for variable definitions.

*, **, *** indicate significance at the 10 percent, 5 percent, and 1 percent levels, respectively, using two-tailed tests.

The t-statistics presented in parentheses are calculated based on robust standard errors clustered by auditor.

[Table 5. Change regression (n=7,117)]

$$\Delta\mathrm{ADA}_t = \beta_0 + \beta_1 CH + \beta_2 CHU + \beta_3 CHD + \beta_4\, BIG4_t + \beta_5 \Delta SIZE_t + \beta_6 \Delta CFO_t + \beta_7 \Delta LEV_t + \beta_8 \Delta ATACC_{t-1} + \beta_9 \Delta Vol.CFO + \beta_{10} \Delta GROWTH.SALE + \beta_{11} LOSSin_t + \beta_{12} LOSSout_t + \beta_{13} MKT_t + \beta_i \Delta AUDITOR.CHAR_t + \gamma YearDummies + \delta IndustryDummies + \varepsilon_t$$

Panel A. Individual regression

***Dependent variable* = ΔADA**

	(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*	*(7)*
ΔHRLEV		-0.0061*					
		(-1.70)					
ΔHRLEV_R			-0.0058*				
			(-1.95)				
ΔHRLEV_U			-0.0025				
			(-0.66)				
ΔEXP				-0.0114*			
				(-1.71)			
ΔTURN					-0.0086*		
					(-1.72)		
ΔWORK						-0.0070**	
						(-2.01)	
ΔWORK_L							-0.0049**
							(-2.28)
ΔWORK_U							-0.0026
							(-0.71)
Change_auditor	-0.0018	-0.0020	-0.0020	-0.0022	-0.0019	-0.0023	-0.0023
	(-0.47)	(-0.54)	(-0.53)	(-0.55)	(-0.50)	(-0.60)	(-0.62)
Change to BIG4	-0.0026	0.0046	0.0065	-0.0091	-0.0030	-0.0030	-0.0024

	(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*	*(7)*
	(-0.47)	(0.77)	(1.01)	(-1.47)	(-0.58)	(-0.58)	(-0.47)
Change to NB4	0.0008	-0.0075	-0.0089	0.0079	-0.0001	-0.0013	-0.0020
	(0.13)	(-0.94)	(-1.05)	(0.97)	(-0.01)	(-0.21)	(-0.32)
BIG4	0.0009	0.0011	0.0011	0.0010	0.0007	0.0003	0.0005
	(0.67)	(0.86)	(0.88)	(0.73)	(0.54)	(0.26)	(0.40)
ΔSIZE	0.0352***	0.0353***	0.0354***	0.0353***	0.0353***	0.0353***	0.0352***
	(4.43)	(4.44)	(4.45)	(4.41)	(4.45)	(4.44)	(4.43)
ΔCFO	-0.0405***	-0.0404***	-0.0405***	-0.0406***	-0.0404***	-0.0403***	-0.0401***
	(-3.43)	(-3.42)	(-3.43)	(-3.45)	(-3.43)	(-3.40)	(-3.39)
ΔLEV	0.1094***	0.1094***	0.1094***	0.1090***	0.1092***	0.1095***	0.1094***
	(10.32)	(10.44)	(10.47)	(10.30)	(10.33)	(10.50)	(10.53)
ΔATACC(t-1)	-0.3352***	-0.3353***	-0.3352***	-0.3350***	-0.3353***	-0.3354***	-0.3352***
	(-24.09)	(-24.12)	(-24.02)	(-23.93)	(-23.96)	(-24.09)	(-24.17)
ΔVol_CFO	0.2889***	0.2888***	0.2888***	0.2887***	0.2888***	0.2892***	0.2887***
	(17.28)	(17.28)	(17.26)	(17.36)	(17.22)	(17.34)	(17.34)
ΔGROWTH_SALE	0.0091***	0.0091***	0.0092***	0.0091***	0.0091***	0.0091***	0.0091***
	(4.70)	(4.72)	(4.72)	(4.65)	(4.71)	(4.71)	(4.72)
LOSS	0.0090**	0.0090**	0.0090**	0.0091**	0.0090**	0.0091**	0.0091**
	(2.37)	(2.38)	(2.38)	(2.40)	(2.39)	(2.39)	(2.40)
LOSS_in	-0.0032	-0.0033	-0.0032	-0.0035	-0.0033	-0.0034	-0.0034
	(-0.69)	(-0.70)	(-0.69)	(-0.74)	(-0.69)	(-0.72)	(-0.72)
LOSS_out	0.0083***	0.0083***	0.0082***	0.0083***	0.0084***	0.0083***	0.0082***
	(2.83)	(2.82)	(2.80)	(2.84)	(2.86)	(2.82)	(2.77)
MARKET	0.0003	0.0003	0.0003	0.0003	0.0002	0.0002	0.0002
	(0.15)	(0.15)	(0.16)	(0.16)	(0.15)	(0.13)	(0.14)
Adj. R-squared	0.187	0.187	0.187	0.187	0.187	0.188	0.188
Fixed effects	Year, Industry	Year, Industry	Year, Industry	Year, Industry	Year, Industry	Year, Industry	Year, Industry

Panel B. Aggregate regression

Dependent variable = ΔADA

	(1)	*(2)*	*(3)*	*(4)*
ΔHRLEV	-0.0071**		-0.0040	
	(-2.09)		(-0.97)	
ΔHRLEV_R		-0.0094***		-0.0082***
		(-3.46)		(-2.92)
ΔHRLEV_U		0.0006		0.0062
		(0.13)		(1.29)
ΔEXP	-0.0126*	-0.0134*	-0.0114	-0.0121
	(-1.84)	(-1.91)	(-1.64)	(-1.61)
ΔTURN	-0.0025	-0.0074	0.0009	-0.0017
	(-0.45)	(-1.21)	(0.15)	(-0.28)
ΔWORK			-0.0046	
			(-1.11)	
ΔWORK_L				-0.0068**
				(-2.61)
ΔWORK_U				-0.0021
				(-0.66)
Control variables	Included	Included	Included	Included
Adj. R-squared	0.188	0.188	0.188	0.188
Fixed effects	Year, Industry	Year, Industry	Year, Industry	Year, Industry

Refer to the Appendix for variable definitions.

*, **, *** indicate significance at the 10 percent, 5 percent, and 1 percent levels, respectively, using two-tailed tests.

The t-statistics presented in parentheses are calculated based on robust standard errors clustered by auditor.

[Table 6. Big 4 and non-Big 4 subsample test]

$$\mathrm{ADA_t} = \beta_0 + \beta_1 BIG4_t + \beta_2 SIZE_t + \beta_3 CFO_t + \beta_8 LEV_t + \beta_5 ATACC_{t-1} + \beta_6\, Vol.CFO + \beta_7\, GROWTH.SALE + \beta_8 LOSS_t + \beta_9 MKT_t + \beta_i AUDITOR.CHAR_t + \gamma YearDummies + \delta IndustryDummies + \varepsilon_t$$

Panel A. Big 4 clients (n=4,095)

Dependent variable = ADA

	(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*	*(7)*	*(8)*	*(9)*
HRLEV		-0.0010						-0.0059	
		(-0.24)						(-0.95)	
HRLEV_R			-0.0025						-0.0059
			(-0.52)						(-1.00)
HRLEV_U			0.0023						0.0001
			(0.59)						(0.06)
EXP				-0.0102***				-0.0144**	-0.0140**
				(-3.04)				(-2.01)	(-2.22)
TURN					-0.0087**			-0.0029*	-0.0036**
					(-2.26)			(-1.72)	(-2.05)
WORK						0.0036			
						(0.72)			
WORK_L							-0.0083***		
							(-8.91)		
WORK_U							0.0027		
							(1.01)		
SIZE	-0.0041***	-0.0041***	-0.0041***	-0.0041***	-0.0041***	-0.0041***	-0.0041***	-0.0041***	-0.0041***
	(-8.82)	(-8.83)	(-8.87)	(-8.78)	(-8.91)	(-8.89)	(-8.94)	(-8.94)	(-8.94)
CFO	-0.0260**	-0.0260**	-0.0260***	-0.0260***	-0.0260***	-0.0260***	-0.0257***	-0.0261***	-0.0261***
	(-3.65)	(-3.63)	(-3.64)	(-3.65)	(-3.67)	(-3.64)	(-3.54)	(-3.65)	(-3.66)

	(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*	*(7)*	*(8)*	*(9)*
LEV	0.0275***	0.0275***	0.0275***	0.0274***	0.0275***	0.0275***	0.0276***	0.0274***	0.0274***
	(3.13)	(3.13)	(3.13)	(3.12)	(3.13)	(3.13)	(3.14)	(3.13)	(3.13)
ATACC(t-1)	0.0494**	0.0495**	0.0494**	0.0494**	0.0497**	0.0494**	0.0499**	0.0496**	0.0496**
	(2.48)	(2.48)	(2.49)	(2.50)	(2.50)	(2.48)	(2.50)	(2.51)	(2.51)
Vol_CFO	0.2469***	0.2469***	0.2469***	0.2467***	0.2468***	0.2469***	0.2464***	0.2468***	0.2468***
	(13.57)	(13.43)	(13.42)	(13.75)	(13.59)	(13.53)	(13.75)	(13.51)	(13.49)
GROWTH_SALE	0.0164***	0.0164***	0.0164***	0.0163***	0.0163***	0.0164***	0.0163***	0.0163***	0.0163***
	(8.78)	(8.79)	(8.72)	(8.69)	(8.78)	(8.75)	(8.75)	(8.71)	(8.67)
LOSS	0.0204***	0.0204***	0.0204***	0.0204***	0.0204***	0.0204***	0.0205***	0.0204***	0.0204***
	(9.32)	(9.32)	(9.29)	(9.26)	(9.41)	(9.27)	(9.09)	(9.28)	(9.29)
MARKET	0.0002	0.0002	0.0003	0.0003	0.0002	0.0002	0.0002	0.0003	0.0003
	(0.13)	(0.13)	(0.14)	(0.17)	(0.13)	(0.13)	(0.10)	(0.16)	(0.16)
Adj. R-squared	0.167	0.167	0.167	0.167	0.167	0.167	0.167	0.167	0.167
Fixed effects	Year, Industry	Year, Industry	Year, Industry	Year, Industry	Year, Industry	Year, Industry	Year, Industry	Year, Industry	Year, Industry

Panel B. non-Big 4 clients (n=3,742)

Dependent variable = ADA

	(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*	*(7)*	*(8)*	*(9)*
HRLEV		-0.0050**						-0.0070***	
		(-2.54)						(-3.53)	
HRLEV_R			-0.0067***						-0.0068**
			(-2.91)						(-2.53)
HRLEV_U			0.0017						-0.0019
			(0.66)						(-0.46)
EXP				-0.0073				-0.0124**	-0.0127**
				(-1.34)				(-2.30)	(-2.20)
TURN					0.0040			0.0065	0.0025
					(0.59)			(1.04)	(0.25)
WORK						-0.0057**			
						(-2.52)			
WORK_L							-0.0032		
							(-0.58)		
WORK_U							-0.0032		
							(-0.67)		
SIZE	-0.0036***	-0.0036***	-0.0036***	-0.0036***	-0.0036***	-0.0036***	-0.0036***	-0.0036***	-0.0036***
	(-4.02)	(-4.03)	(-4.05)	(-4.03)	(-4.03)	(-4.02)	(-3.96)	(-4.03)	(-4.04)
CFO	-0.0119	-0.0106	-0.0108	-0.0124	-0.0120	-0.0106	-0.0107	-0.0112	-0.0112
	(-0.88)	(-0.80)	(-0.81)	(-0.92)	(-0.89)	(-0.81)	(-0.81)	(-0.84)	(-0.85)
LEV	0.0427***	0.0429***	0.0429***	0.0428***	0.0427***	0.0431***	0.0430***	0.0429***	0.0429***
	(7.30)	(7.38)	(7.27)	(7.28)	(7.27)	(7.47)	(7.47)	(7.29)	(7.22)
ATACC(t-1)	0.0638***	0.0629***	0.0632***	0.0638***	0.0639***	0.0628***	0.0629***	0.0628***	0.0630***
	(3.33)	(3.28)	(3.30)	(3.32)	(3.32)	(3.26)	(3.27)	(3.27)	(3.28)
Vol_CFO	0.2491***	0.2495***	0.2492***	0.2487***	0.2490***	0.2496***	0.2495***	0.2491***	0.2489***
	(11.18)	(11.20)	(11.21)	(11.17)	(11.19)	(11.21)	(11.20)	(11.19)	(11.18)

	(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*	*(7)*	*(8)*	*(9)*
GROWTH_SALE	0.0179***	0.0179***	0.0180***	0.0179***	0.0179***	0.0177***	0.0177***	0.0180***	0.0180***
	(5.10)	(5.12)	(5.18)	(5.10)	(5.11)	(5.06)	(5.05)	(5.17)	(5.17)
LOSS	0.0174***	0.0177***	0.0177***	0.0173***	0.0174***	0.0175***	0.0175***	0.0176***	0.0177***
	(4.66)	(4.75)	(4.73)	(4.62)	(4.63)	(4.71)	(4.71)	(4.70)	(4.70)
MARKET	0.0065**	0.0064**	0.0063**	0.0061**	0.0065**	0.0060**	0.0061**	0.0057**	0.0057**
	(2.53)	(2.52)	(2.46)	(2.34)	(2.48)	(2.34)	(2.34)	(2.17)	(2.18)
Adj. R-squared	0.181	0.182	0.182	0.181	0.181	0.183	0.182	0.183	0.183
Fixed effects	Year, Industry	Year, Industry	Year, Industry	Year, Industry	Year, Industry	Year, Industry	Year, Industry	Year, Industry	Year, Industry

Refer to the Appendix for variable definitions.

*, **, *** indicate significance at the 10 percent, 5 percent, and 1 percent levels, respectively, using two-tailed tests.

The t-statistics presented in parentheses are calculated based on robust standard errors clustered by auditor.

[Table 7. Alternative calculations of discretionary accruals]

Dependent variable = ADA

	Kothari et al.(2005)		*ROA controlled Jones*		*Modified Jones (1991)*	
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
HRLEV	-0.0062**		-0.0059***		-0.0064***	
	(-2.02)		(-3.17)		(-3.41)	
HRLEV_R		-0.0133***		-0.0071***		-0.0076***
		(-4.04)		(-3.38)		(-3.42)
HRLEV_U		0.0149**		0.0016		0.0016
		(2.56)		(0.54)		(0.54)
EXP	-0.0051	-0.0018	-0.0115***	-0.0110***	-0.0111***	-0.0105**
	(-0.86)	(-0.30)	(-2.91)	(-2.63)	(-2.69)	(-2.47)
TURN	-0.0079	-0.0288**	0.0053	-0.0004	0.0039	-0.0022
	(-0.71)	(-2.24)	(1.13)	(-0.07)	(0.86)	(-0.33)
BIG4	0.0028	0.0037	-0.0002	0.0005	0.0008	0.0016
	(0.51)	(0.75)	(-0.07)	(0.16)	(0.23)	(0.45)
SIZE	0.0043***	0.0043***	-0.0037***	-0.0038***	-0.0038***	-0.0038***
	(5.42)	(5.46)	(-9.03)	(-9.09)	(-8.24)	(-8.27)
CFO	-0.2112***	-0.2108***	-0.0294***	-0.0293***	-0.0420***	-0.0420***
	(-15.70)	(-15.78)	(-4.05)	(-4.08)	(-4.85)	(-4.86)
LEV	-0.0102	-0.0099	0.0323***	0.0323***	0.0302***	0.0303***
	(-1.29)	(-1.26)	(5.40)	(5.37)	(4.55)	(4.54)
ATACC(t-1)	0.0365*	0.0374*	0.0610***	0.0613***	0.0574***	0.0577***
	(1.70)	(1.75)	(5.18)	(5.22)	(3.94)	(3.97)
Vol_CFO	0.1973***	0.1969***	0.2497***	0.2496***	0.2649***	0.2648***
	(10.11)	(10.19)	(19.46)	(19.47)	(19.17)	(19.15)
GROWTH_SALE	0.0159***	0.0160***	0.0179***	0.0180***	0.0166***	0.0167***
	(4.45)	(4.38)	(9.57)	(9.61)	(8.57)	(8.60)
LOSS	-0.0265***	-0.0265***	0.0159***	0.0159***	0.0220***	0.0220***
	(-5.41)	(-5.36)	(8.56)	(8.53)	(9.52)	(9.50)
MARKET	-0.0014	-0.0014	0.0025	0.0025	0.0032	0.0032
	(-0.46)	(-0.46)	(1.26)	(1.26)	(1.58)	(1.59)
Observations	8,647	8,647	8,618	8,618	8,647	8,647
Adj. R-squared	0.257	0.258	0.177	0.177	0.188	0.188
Fixed effects	Year, Industry	Year, Industry	Year, Industry	Year, Industry	Year, Industry	Year, Industry

Refer to the Appendix for variable definitions.

*, **, *** indicate significance at the 10 percent, 5 percent, and 1 percent levels, respectively, using two-tailed tests.

The t-statistics presented in parentheses are calculated based on robust standard errors clustered by auditor.

[Table 8. Non-linear relationship test]

Dependent variable = ADA

	Full sample		***Big-4***		***Non-Big 4***	
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
D_highHRLEV	0.0005	0.001	-	-	0.0016	0.0004
	(0.07)	(0.15)	-	-	(0.19)	(0.06)
D_highEXP	-0.091*	-0.0867*	-	-	-0.1305**	-0.1313**
	(-1.97)	(-1.89)	-	-	(-2.56)	(-2.61)
D_highTURN	0.0032	0.0035	-15.7191**	-15.1651*	0.0017	0.0027
	(1.17)	(1.33)	(-2.14)	(-1.79)	(0.65)	(0.90)
Low_HRLEV	-0.0101		-		-0.0116	
	(-1.29)		-		(-1.39)	
High_HRLEV	-0.0085***		-0.0038		-0.0099***	
	(-2.74)		(-0.57)		(-2.69)	
Low_HRLEV_R		-0.0115		-		-0.0137
		(-1.32)		-		(-1.50)
High_HRLEV_R		-0.0101***		-0.0038		-0.0087**
		(-3.09)		(-0.54)		(-2.21)
Low_HRLEV_U		0.0022		-		0.0022
		(0.10)		-		(0.10)
High_HRLEV_U		0.0017		-0.0006		-0.0034
		(0.65)		(-0.22)		(-0.77)
Low_EXP	-0.0218***	-0.0216***	-0.0089	-0.0095	-0.0426***	-0.043***
	(-3.87)	(-3.73)	(-0.88)	(-0.94)	(-3.30)	(-3.35)
High_EXP	0.0149	0.0136	-	-	0.0129	0.0129
	(0.87)	(0.79)	-	-	(0.77)	(0.77)
Low_TURN	0.0229	0.0273	-169.997**	-164.007*	0.0412	0.04
	(0.65)	(0.76)	(-2.14)	(-1.79)	(1.00)	(0.96)
High_TURN	0.0048	-0.0029	-0.0056**	-0.0055**	0.0079	0.0019
	(1.09)	(-0.54)	(-1.80)	(-2.33)	(1.24)	(0.15)
BIG4	-0.0021	-0.0007	-	-	-	-
	(-0.56)	(-0.17)	-	-	-	-
SIZE	-0.0039***	-0.0039***	-0.0043***	-0.0043***	-0.0037***	-0.0037***
	(-8.88)	(-8.90)	(-13.90)	(-14.09)	(-3.76)	(-3.76)
CFO	-0.0202**	-0.0201**	-0.0308***	-0.0308***	-0.0075	-0.0074
	(-2.33)	(-2.33)	(-3.69)	(-3.69)	(-0.52)	(-0.51)
LEV	0.0364***	0.0365***	0.0269***	0.0268***	0.0496***	0.0497***
	(5.58)	(5.58)	(3.16)	(3.16)	(8.44)	(8.52)
ATACC(t-1)	0.0572***	0.0576***	0.0522**	0.0522**	0.0616***	0.0618***
	(3.89)	(3.94)	(2.43)	(2.43)	(2.86)	(2.87)
Vol_CFO	0.2533***	0.2533***	0.244***	0.244***	0.2636***	0.2635***
	(18.61)	(18.62)	(18.26)	(18.17)	(10.63)	(10.61)
GROWTH_SALE	0.0179***	0.0179***	0.0167***	0.0167***	0.0189***	0.019***
	(9.38)	(9.46)	(6.97)	(6.95)	(5.28)	(5.32)
LOSS	0.0197***	0.0198***	0.0211***	0.0211***	0.0173***	0.0174***
	(9.20)	(9.15)	(10.45)	(10.44)	(3.96)	(3.96)
MARKET	0.0031*	0.0031*	0.0008	0.0008	0.0066**	0.0066**
	(1.91)	(1.91)	(0.57)	(0.57)	(2.35)	(2.37)

Observations	7,795	7,795	4,505	4,505	3,290	3,290
Adj. R-squared	0.178	0.178	0.167	0.167	0.195	0.194
Fixed effects	Year, Industry	Year, Industry	Year, Industry	Year, Industry	Year, Industry	Year, Industry

Refer to the Appendix for variable definitions.

*, **, *** indicate significance at the 10 percent, 5 percent, and 1 percent levels, respectively, using two-tailed tests.

The t-statistics presented in parentheses are calculated based on robust standard errors clustered by auditor.

[Table 9. Post-IFRS period]

Dependent variable = ADA

	Full sample		***Big-4***		***Non-Big 4***	
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
HRLEV	-0.0027		-0.0039**		-0.0023	
	(-1.04)		(-3.81)		(-0.81)	
HRLEV_R		-0.0068**		-0.0053*		-0.0067*
		(-2.47)		(-2.70)		(-1.82)
HRLEV_U		0.0195**		0.0116		0.0214*
		(2.45)		(0.99)		(1.69)
EXP	-0.0095	0.0032	-0.0697***	-0.0392	-0.0050	0.0053
	(-1.11)	(0.32)	(-15.23)	(-1.44)	(-0.56)	(0.45)
TURN	0.0040	-0.0020	-0.0056	-0.0037	0.0014	-0.0078
	(0.40)	(-0.21)	(-0.87)	(-0.68)	(0.07)	(-0.39)
BIG4	-0.0040	-0.0064				
	(-0.66)	(-1.26)				
SIZE	-0.0051***	-0.0051***	-0.0053***	-0.0052***	-0.0050***	-0.0051***
	(-6.42)	(-6.40)	(-8.18)	(-8.06)	(-2.93)	(-2.96)
CFO	0.0048	0.0046	-0.0256	-0.0255	0.0478	0.0485
	(0.27)	(0.26)	(-1.38)	(-1.37)	(1.48)	(1.51)
LEV	0.0355***	0.0358***	0.0313	0.0314	0.0396***	0.0401***
	(3.29)	(3.31)	(1.77)	(1.78)	(2.96)	(2.98)
ATACC(t-1)	0.0650***	0.0649***	0.0420*	0.0422*	0.0952***	0.0954***
	(3.07)	(3.07)	(2.37)	(2.38)	(2.73)	(2.75)
Vol_CFO	0.2839***	0.2840***	0.3076**	0.3074**	0.2458***	0.2455***
	(7.98)	(8.00)	(5.24)	(5.24)	(4.99)	(5.00)
GROWTH_SALE	0.0211***	0.0213***	0.0283***	0.0284***	0.0117	0.0122
	(4.92)	(5.02)	(7.75)	(7.77)	(1.42)	(1.49)
LOSS	0.0156***	0.0154***	0.0136	0.0136	0.0186***	0.0183***
	(3.77)	(3.76)	(1.84)	(1.84)	(4.10)	(4.06)
MARKET	0.0021	0.0022	0.0045*	0.0045*	-0.0005	-0.0008
	(1.04)	(1.07)	(3.15)	(3.16)	(-0.12)	(-0.18)
Observations	2,750	2,750	1,572	1,572	1,178	1,178
Adj. R-squared	0.179	0.181	0.197	0.197	0.163	0.164
Fixed effects	Year, Industry	Year, Industry	Year, Industry	Year, Industry	Year, Industry	Year, Industry

Refer to the Appendix for variable definitions.

*, **, *** indicate significance at the 10 percent, 5 percent, and 1 percent levels, respectively, using two-tailed tests.

The t-statistics presented in parentheses are calculated based on robust standard errors clustered by auditor.

국문초록

감사인의 인력구조와 감사품질의 관계

이유진
경영학과 회계학 전공
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본 연구는 감사법인의 인력구조가 감사 품질에 미치는 영향에 대해 분석한다. 본 연구는 2003년부터 의무 공시되는 한국 회계법인의 인력 관련 공시 데이터를 활용하며, 감사 품질은 성과 조정된 재량적 발생액으로 측정하였다. 연구 결과, 회계법인의 인력구조 중 인력 레버리지, 회계사 경력 및 파트너 당 업무 강도가 감사품질과 정의 상관관계를 가짐을 확인하였으며, 일부 비선형적 관계도 관찰되었다. 인력구조와 감사품질과의 관계는 대형 회계법인과 중소형 회계법인 사이에 차이가 있으며, 특히 인력 레버리지의 효과가 대형회계법인에서는 유의하지 않다. 본 연구는 회계법인, 피감사기업 및 규제당국에 감사품질 관리를 위한 실무적인 지침을 제공한다는 측면에서 그 의의가 있다.

주요어: 감사품질, 감사인 특성, 인력 구조, 재량적 발생액, Big 4.
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